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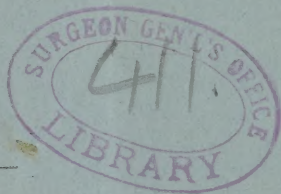
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Recovery in One : Death from Chloroform in the Other.

BY

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THOMAS MANLEY, M.D.,

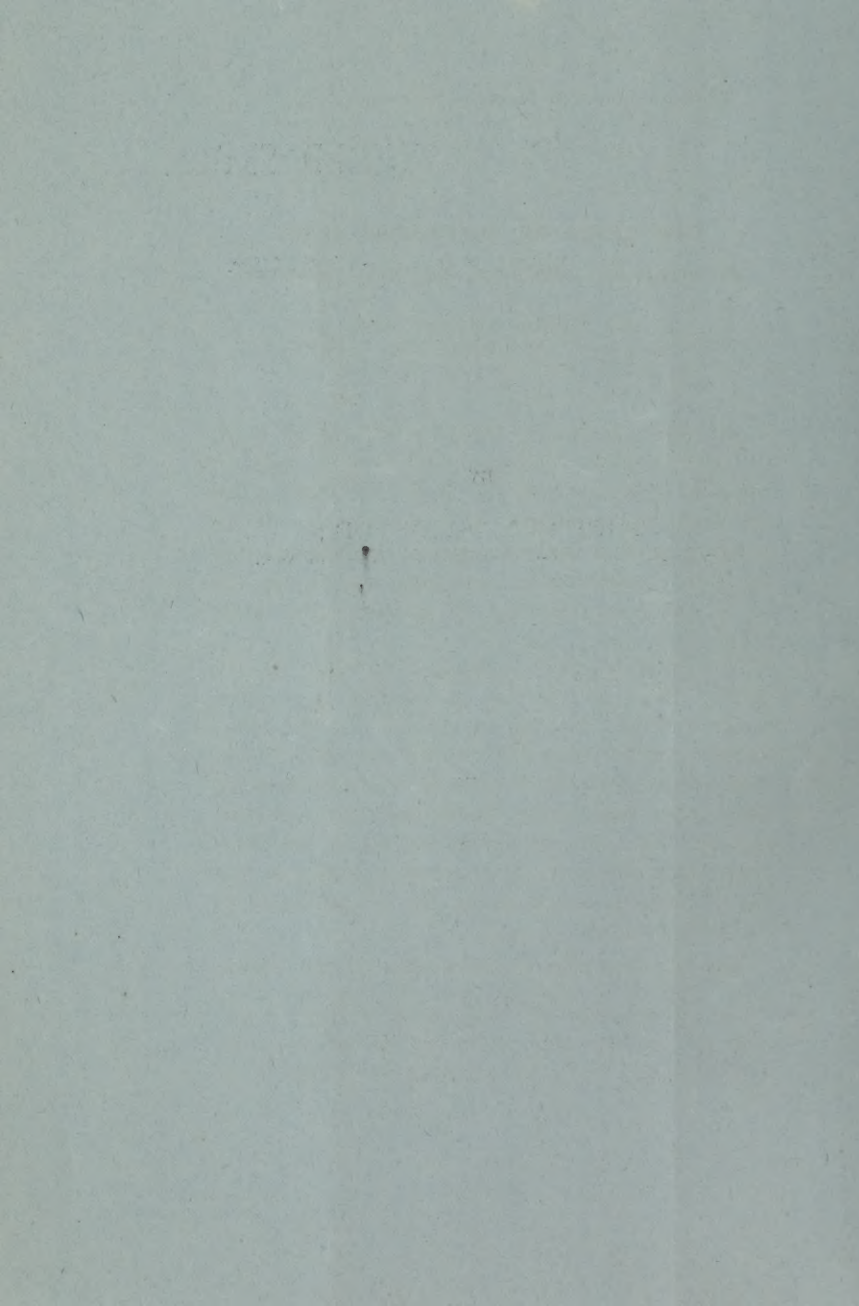
VISITING SURGEON TO THE HARLEM HOSPITAL, NEW YORK.



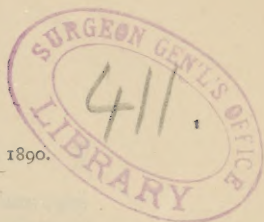
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TWO CASES OF FRACTURED SKULL.

Recovery in One ; Death from Chloroform in the Other.

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BY THOMAS MANLEY, M.D.,

VISITING SURGEON TO THE HARLEM HOSPITAL, NEW YORK.

ALTHOUGH traumatic lesions of the cranial shell, in large cities, are of frequent occurrence, those of the kind here described are rarely seen. Both cases are singularly interesting in causation, age of the patients, location and similarity of the lesions, clinical history, pathological conditions, and in the state of the nerve-centres when the patients came under observation.

Now, that cerebral localization is being investigated with great care and minuteness, it is interesting to note how far experiments on the lower animals can be utilized for clinical purposes in man. And further, since the two Hyderabad Commissions have given their, rather conflicting, but, nevertheless, very full and exhaustive, reports on the lethal action of chloroform, it is timely to note precisely the phenomena which attend the mortal action of this drug on man.

The two boys who are the subject of this history were injured on the afternoon of June 11, 1890. They, with eight or ten companions, found a truck, used for moving stone, standing by the roadside. They got hold of it, some pulling and others push-

ing, and dragged it up a steep hill. Reaching the summit, they turned it around, got aboard, and let it go down. What the ultimate fate of all the adventurers was after they started on their journey down the hill we are unable to record, but a police officer, hearing the noise of the truck and the screams of the children, hurried into the field, to find the truck capsized near the foot of the hill, and two boys lying about midway down the declivity, both being unconscious, and one apparently dead. The Harlem Hospital ambulance was sent for, and, on its arrival, Dr. F. P. Hammond, the ambulance-surgeon, found W. P., the older boy, apparently moribund. He breathed only in gasps, at long intervals; the pulse was absent in one wrist, and in the other only a feeble flicker could be detected. Respiration was stertorous; blood mingled with saliva was oozing from the mouth and nose, and there was a bloody fluid flowing from the left ear. Dr. Hammond vigorously stimulated the patient by hypodermic injections, sponged out the mouth, and douched the face with cold water. The little fellow gradually reacted, and in half an hour was in the ambulance.

The other boy, B. J., lay on his back, bleeding freely from a wound of the head, and was also insensible. His general condition was not bad, and before he reached the hospital he regained consciousness.

In each case antiseptic dressings were immediately applied with as much care as possible.

I saw the cases three hours after they were admitted to the hospital. They were then perfectly conscious, but could not give a clear account of the accident. The older boy was still suffering from shock. His pulse was slow, 60 beats to the minute, and the pupils were markedly contracted. The out-

line of the features was regular, and the nose, ears, and lips of an ashy pallor. The extremities were cool, with marked, though not total, abolition of the reflexes. There were areas on the inner side of the thighs in which sensation was wholly lost, and others on the palmar surface of the hands where, though sensation was intact, mobility was lost. When asked to move a limb he did so slightly, but with great effort, and on one side only. He was somewhat deaf. Immediately behind the right ear there was a scalp wound exposing the bone. There was free hæmorrhage from the nose, mouth, and left ear, and from the latter the blood was somewhat serous and straw-colored in character.

His condition indicated fracture of the base of the skull, probably with free hæmorrhage into one of the great cavities of the body.

He was brought into the operating-room, and, as a preliminary to the examination of the wound, we adopted the recommendation of Dr. F. S. Dennis, and shaved the entire scalp, in order that antisepsis might be more rigorously carried out. At the seat of injury we found a fracture which was almost circular, with its greatest diameter from before backward. The large disk of bone was driven into the brain, being wholly detached at its circumference. The position of the fracture was on a line with, and immediately behind, the concha of the ear. The skull surrounding the fracture was fissured in a radiating manner, the fissures extending backward and toward the base being the deepest and most widely separated. Considering the cranio-cerebral topography of the lesion, it was evident that the left lateral sinus was nearly in the centre of this depressed plate of bone, which was evidently a part of both the parietal and occipital bones.

The safest course to pursue was now a question

which did not permit much deliberation. Whether, bearing in mind the close proximity of the large venous channel, it might not be safer to cleanse the parts thoroughly, and let the fracture alone—as, independent of the eyes, we had no distinctive indication of cerebral pressure—or whether it would not be better to trephine at once, were the questions which had to be decided. We all know that hæmorrhage from vessels within the skull is sometimes difficult or absolutely impossible to check. We know, too, that an aseptic blood-clot—if not large or within the brain—often undergoes disintegration, organization, or absorption, without causing serious harm. We know further—though, unfortunately, operators are loath to report such cases—that an operation to remove depressed bone, or large blood-clots, may in itself be fatal. I have had, in about one hundred and fifty fractured skulls which I have treated, two such cases.

In one we were removing a large fragment of bone driven into the brain, almost at the confluence of the cranial sinuses. The spicula of bone came out quite readily, but it was followed by a deluge of blood which could not be controlled. In the other case, I trephined above the ear, over the temporo-parietal articulation, for symptoms of compression following an injury. We came at once, upon a very large intradural coagulum. After I had gnawed away, with the rongeur, sufficient bone to remove the clot, I commenced to crush it gently with the fingers, working cautiously until I believed it was nearly displaced, when a jet of dark, tarry blood welled up from the bottom of the space left by the clot. It came in torrents, and our compresses and hæmostatic forceps were useless. We had re-opened a large trunk which the clot had plugged, and it was fatal. I may add, that I have

heard of similar disasters, in the hands of others, but they have not been published.

To return to the present case. I decided to try to elevate, as the fragment was driven in so far that I was able, by chipping off enough bone from the overlapping margin, to get my elevator between the dura and the skull, using the edge as a fulcrum. Happily, I was able to raise quite easily the fragment to its normal position. Very little blood was lost, and the wound, with the entire cranium, the neck, and the eyes, were enveloped in soft antiseptic gauze.

During the night, following the operation, the patient moaned, groaned, cried, and vomited. He had two or three sinking spells and became cold; but Dr. Guest, the house-surgeon, used heat and stimulants energetically, and the boy reacted.

I saw him at 10 A.M., June 17th. At this time it seemed that he could not recover. His pulse was 186, and his temperature subnormal, and he had the heaving respiration which Bell¹ has so well described, as a sure precursor of death. But by noon he commenced to rally and he has made a good recovery; although both pupils are dilated, and he has double convergent squint. Hearing has been perfectly regained and there is no trace of paralysis.

It is interesting to note that in this case we had almost unequivocal evidence of fracture through the base of the skull, and yet the patient made a good recovery, the only organic disturbance at this date being confined to the organs of vision.

Dr. Ferrier in his recent Croonian lectures on "Cerebral Localization," tells us that "the occipito-anterior region is the visual area of the cortex."

¹ Sir Charles Bell: *Nervous System*, second edition, p. 203.

It seems that this conclusion has been reached, mainly by experiments on monkeys and clinical observations on man. Considering the location of the lesion, in the case just described, and the marked disturbance of the visual organs, at the time of the injury and since, I think that the patient's condition is strong evidence in favor of the correctness and accuracy of the statement made by Dr. Ferrier.

There can be no doubt that considerable blood escaped into, and through the cerebral substance, and that, following the line of fracture, it ultimately lodged in close contact with the base of the pons Varolii and the corpus pyramidale, where, by pressure, it interfered with the nutrition and functions of the ocular nerves, notably and persistently with the abducens.

With the ultimate reduction and absorption of the effused blood, I expect perfect restoration of accommodation.

The younger of the two boys, B. J., when I saw him, had a large hæmatoma directly behind the right ear, in precisely the same situation as the wound in the preceding case, except that the tumor extended slightly downward into the cellular tissue of the neck. The house-surgeon had made a diagnosis of fracture of the skull. The patient had almost no constitutional disturbance, but there had been nasal hæmorrhage. He did not complain of pain, and moved about in bed without difficulty. He was slightly pale, however, and vomited twice after entering the hospital.

The contour of the hæmatoma, with its firm, bevelled border and depressed centre—characters

common to all cranial hæmatomata—and the total absence of any cerebral symptoms, led me to believe that there was no fracture.

The scalp over the swelling was shaved and cleansed, after which I made an incision into the tumor and evacuated it, when I found well-marked linear fractures; one running antero-posteriorly, intersected by another passing toward the base. The greatest extent of fracture was in the occipital bone, extending but two or three lines into the parietal. There was very slight depression of the upper boundary, of the divided plate. Under strict antisepsis, I closed the incision with a continuous suture, and applied the usual dressing.

The following morning the patient was in excellent condition, and speedy recovery seemed probable. At noon of this day he vomited. At 2 P.M. the temperature was 102° . Internal squint of the left eye, varying in degree, was noticed, and the pupil was slightly dilated. He was able to urinate and had no paralysis of the extremities.

On June 17th it was noted that he had passed a restless night. At 8 A.M., temperature was $103\frac{1}{2}^{\circ}$, and at 10.40 A.M. was the same; at 12.30 P.M. temperature was $103\frac{2}{5}^{\circ}$. At 1.20 A.M., June 19th, temperature was $103\frac{5}{8}^{\circ}$; at 2 P.M. temperature was $104\frac{1}{5}^{\circ}$.

I saw him at 3 P.M. on this date. He now had well-marked symptoms of compression with meningitis. His pulse was very rapid, the temperature high, and he was incessantly moving about in the bed. Marked congestion of the conjunctival vessels clearly indicated cerebral hyperæmia.

His mental condition at this stage presented many features of interest. He would have intervals of repose, in which he would lie on his back, with his eyeballs immovably set and the lids widely opened,

muttering incoherently to himself. Every few minutes he would arouse from this condition for a short time. When asked how he felt, he would look up, answer intelligently and complain of great pain throughout his head. Then he would immediately lapse into a semi-conscious condition with his eyes open.

It was only too apparent that serious mischief had resulted from the injury, but whether from local conditions, as the pressure of a shattered internal table, or of a clot, was difficult to determine. It was too early for pus to have formed.

I had recently seen two cases of traumatic meningitis in boys: one from fracture of the skull, the other from an infected scalp wound. In both there were well-defined cortical lesions, with all the typical symptoms. On trephining these cases, however, nothing was found but a general meningitis, a diagnosis confirmed by autopsy.

In the present case, it seemed to me that there were no symptoms which could be relied upon as an indication to operate. Besides, in refraining from operating I followed the opinion of the veteran French surgeon Verneuil, who says: "*Qu'on fasse dans le laboratoire toutes les expériences, qu'on vandra; mais qu'on se garde les transportes au lit du malade.*"¹ This entirely harmonizes with my own experience.

I was anxious to ascertain the condition of the wound, and, if I found indications of incipient otitis, to trephine, as recommended by Bryant.² My intention was to remove one or two sutures, inspect the line of incision, and reclose the wound without using an anæsthetic. But I found the

¹ *Mercredi Médical*, May 27, 1890.

² *Surgery*, third edition.

tissues behind the ear puffed, cedematous, and discolored. On freeing two or three of the sutures I saw that the whole wound was in a bad condition. The edges were covered with a dirty grayish exudate, and were slightly everted, and the whole had an appearance indicative of disease beneath the bone.

As I saw that our operative procedures would be somewhat tedious, and as the patient was keenly sensitive to pain, and, excepting his temperature, in a good general condition, I decided to give him a few whiffs of chloroform, presuming that this would be taken with less resistance and more rapidly than ether, and that it would not congest the vessels of the brain.

Dr. F. P. Hammond, third assistant-surgeon of the hospital, an extremely cautious and painstaking man, administered the chloroform by sprinkling a few drops on lint placed in a tumbler. I had denuded the skull, and removed a piece of bone with a small trephine and rongeur, when I noticed, in an instant, several terrible changes. The patient ceased to breathe; his features were black and bloated; he foamed at the mouth; the eyes bulged, and plainly he was asphyxiated. Feeling for the radial pulse, I was amazed to find it full, slow, and regular—about 60 to the minute. We had before us a genuine case of chloroform-poisoning, with all the symptoms which have been described by other authors and investigators.

The *respiratory centres yielded first*. This was clear and unmistakable. All our resources were immediately applied, namely, artificial respiration, inversion, inhalation of nitrite of amyl, hypodermic injection of atropine, drawing the tongue forward, douching of the face, and friction of the body. After an interval of what seemed five, though in reality not

more than two, minutes, the patient gasped several times. A little later he breathed again, but very irregularly, and would cease unless artificial respiration were continued. Respiration seemed quite fairly reëstablished at one time. It was interesting to note the condition of the brain in the meantime. With dyspnœa and apnœa the brain-tissue crowded into the gap made by the rongeur. The vessels were enormously distended, and of a deep black color. With partial return of respiration the brain gradually receded, and the vessels collapsed to their usual calibre and assumed their normal tint. I had noticed, however, before the symptoms of asphyxia developed, that the cerebral vessels were greatly distended.

No more chloroform was given after the first lethal symptoms were manifest.

Although respiration was partially restored, the deep cyanosis remained, the breathing continued stertorous, and frothy mucus, tinged with blood, oozed from the mouth. In about five minutes, or possibly a little longer, there was another break in the rhythm of the breathing. This time all our efforts were futile. As in the first instance, the pulse continued to beat fully two minutes after the patient was apparently dead, or rather had ceased to breathe.

Although I have witnessed the administration of ether and chloroform a great many times, this is the first case in which I have seen death immediately and directly attributable to the anæsthetic.

This case so clearly and absolutely proves that the lethal action of chloroform begins by benumbing the respiratory centres, that no one can question it. The condition is a veritable asphyxia. The phenomena, to the eye, are precisely the same as those seen in cases of spasm or stenosis of the larynx; in

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persons who have been submerged in water, and in those struggling through an epileptic fit, when the laryngeal muscles are temporarily convulsed.

It was in the *initial* stages of anæsthesia that the respirations ceased, and after very little chloroform had been given. The vaso-motor nerves and the cardiac centres were affected *consecutively*. The blood, surcharged with carbonic acid, soon destroyed the vitality and irritability of the pneumogastric and sympathetic nerves.

Clearly perceiving, then, how the action of the drug manifests itself, we are in a position to deal with it intelligently. We should act with two objects in view: first, to unload the vascular system, and the brain; and, second, to keep up respiration. It may be said that when breathing ceases the respiratory centres are paralyzed, and all efforts at resuscitation are useless.

But we see many cases which prove that this is not always true. A case of tracheotomy, for instance, reported by me in the *New England Medical Monthly*, January, 1890, is an illustration. In this case, after the trachea was opened, the patient inspired blood. He ceased to breathe, but the pulse continued to beat for some time. With the body limp and apparently lifeless, we worked fully five minutes with artificial respiration, when the patient gasped, and shortly revived, ultimately making a good recovery.

A surgeon related to me, how in a case of croup, he called in a consultant, who advised tracheotomy. Some blood was drawn into the windpipe, the infant had a terrible convulsion, and turned over apparently dead. The consultant, quite shocked at

the result, and fearing the maledictions of the parents, immediately left. But the attending physician remained at his post, wiped out the bleeding opening, and with his own lips blew into the child's trachea. In a few moments—fully ten, he thinks—the child commenced to breathe, and finally made a good recovery.

In the case reported above, had we worked more diligently at renewing the air in the lungs, and given less attention to the incision, the result might have been different. But we were too confident; besides, I had to search for and ligate a small meningeal vessel which commenced to spurt freely. When respiratory paralysis occurred for the second time, had we done a tracheotomy and used the invaluable apparatus of Dr. Joseph Fell, of Buffalo, for forced respiration, I am confident our patient might have been saved.

The unfortunate termination of this case has more strongly than ever convinced me of the imperative need of an experienced and trained anæsthetizer—one who will give his whole attention to administering anæsthetics; a man of good judgment and who is solely concerned with the patient's general condition. He should be specially licensed, and the administration of an anæsthetic, other than in an emergency, by anyone not professionally and legally qualified should be regarded as a misdemeanor. The present custom is dangerous, and little short of being positively criminal. Usually the anæsthetic is committed to the junior assistant, who is almost wholly ignorant of practical work. He is often more interested in the operation than in giving

the anæsthetic, so that when he finally looks into his patient's face, and feels the pulse, perchance the patient is dead. Let us hope that a reform in this matter will soon be accomplished.

The physical characteristics of the two fractures demand only brief mention. From a medico-legal point of view, they are full of interest, and also to those who may be called on, in a court of justice, to testify as to the quality and direction of force brought to bear in traumatic lesions of the skull.

It will be noted that the children were found alone and unconscious, in an open field. No one has been found who saw the accident, or at least who will admit that he saw it.

In each case, so similar were the osseous lesions in extent and direction, that it would certainly seem that they were inflicted with precision and deliberation. The violence must have been great and concentrated. Its point of impact was very limited, and chiefly in the direction of the base. There were no rocks in the place where the boys were injured. It is hard to conceive how these boys, of light weight, precipitated from a stone-truck, about two feet from the ground, to soft, elastic turf, could receive such injuries. Did the wheels pass over their necks or heads? There were no abrasions or contusions except those immediately over the wounds, and if the wheel had passed over their heads the wounds would have been larger.

Had not the boys regained consciousness, or had they been found dead, so that no history could have been obtained from themselves, the state of the in-

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tegument, the shape, direction, and extent of the fractures would have thrown no light on the injury.

These cases would seem to prove that there are serious bone-lesions in which we are absolutely unable, from the condition of the parts, to say what was the nature of the force, or in what direction it was applied ; hence the importance of the surgeon proceeding with great caution when giving testimony, on which great consequences or even a human life may depend, when such testimony is merely presumption or hypothetical premises.

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